(12) UK Patent Application (19) GB (11) 2 336 221 (13) A

(43) Date of A Publication 13.10.1999

(21) Application No 9905219.3

(22) Date of Filing 09.03.1999

(30) Priority Data
(31) 09058599 (32) 10.04.1998 (33) US

(51) INT CL[6]
B60R 25/00 // G07C 5/00 , G07F 7/10

(52) UK CL (Edition Q)
G3N NGA4 NG1A4 N262 N275 N286A N286B N286C N287 N288A N397 N402B N403
U1S S1843

(56) Documents Cited
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EP 0345785 A1 EP 0178439 A1 WO 84/03785 A1
US 4477874 A

(58) Field of Search
UK CL (Edition Q) G3N NGA4 NGBC2 NGBD NGBD1 NGB2 NGB2A NGF NGF2 NGL NG1AX NG1A4 NG1A9 NG1B
INT CL[6] B60R 25/00
Online databases: EPODOC, JAPIO, WPI

(71) Applicant(s)
International Business Machines Corporation
(Incorporated in USA - New York)
Armonk, New York 10504, United States of America

(72) Inventor(s)
Kenneth Alan Goldman
Charles Campbell Palmer
Elaine Rivette Palmer

(74) Agent and/or Address for Service
C Boyce
IBM United Kingdom Limited, Intellectual Property Department, Mail Point 110, Hursley Park, WINCHESTER, Hampshire, SO21 2JN, United Kingdom

(54) Abstract Title
Customization of vehicle controls for different drivers; restricting and logging use of vehicle

(57) Individual driver selected settings for each of a plurality of functional devices 120, such as seat position, steering wheel height, radio, heating/ventilation and vehicle performance and driving comfort controllers may be held in a storage device 100 such as a smart card, floppy disk etc. The storage device can be read by one or more acceptance devices 110 in or on the vehicle and controller 130 transfers the settings to the functional devices. Desired settings may be stored on the storage device using the same equipment after the driver has set them manually. The system may be used, in conjunction with a global positioning system and radio control, to impose speed limits and location/distance and route restrictions on specific drivers. Data logging of driver and vehicle performance may also be carried out by the controller and transferred when desired to the storage device.

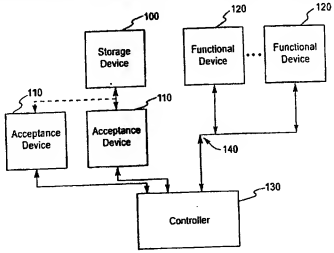

Fig. 1

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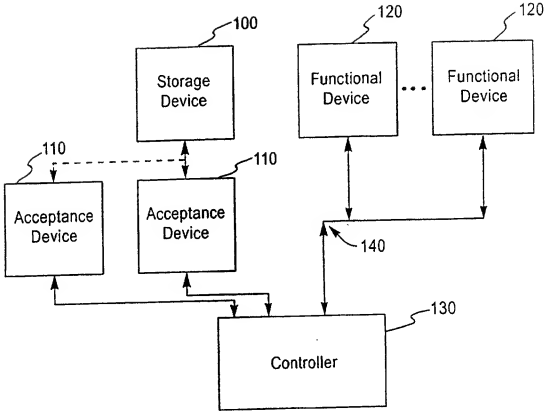
100
Storage Device
120
Functional Device
120
Functional Device
110
110
Acceptance Device
Acceptance Device
140
130
Controller

Fig. 1

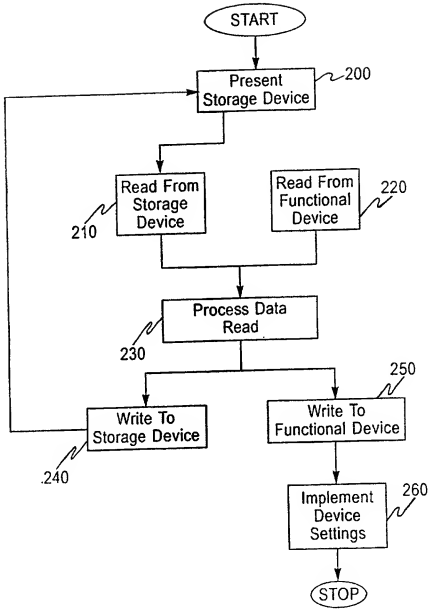
START
Present Storage Device
200
Read From Storage Device
210
Read From Functional Device
220
Process Data Read
230
Write To Storage Device
240
250
Write To Functional Device
Implement Device Settings
260
STOP

Fig. 2

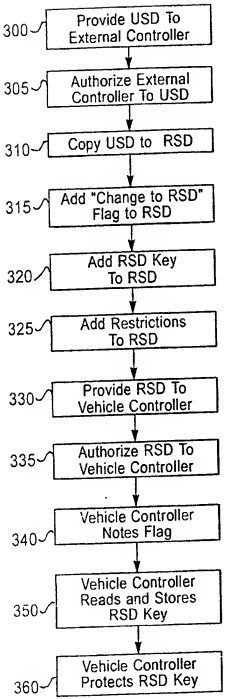

Fig. 3

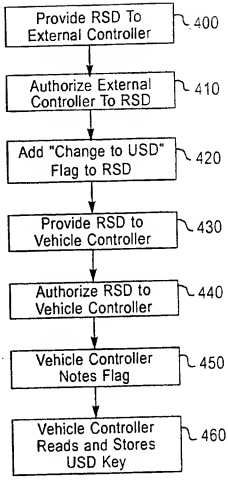

Fig. 4

USD = Unrestricted Storage Device
RSD = Restricted Storage Device

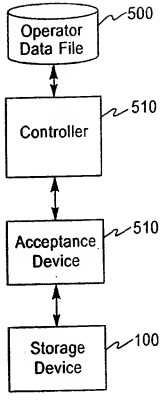
Operator Data File
500
Controller
510
Acceptance Device
510
Storage Device
100

Fig.5

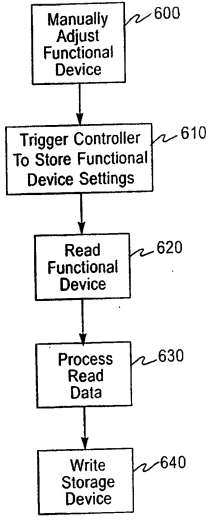
Manually Adjust Functional Device
600
Trigger Controller To Store Functional Device Settings
610
Read Functional Device
620
Process Read Data
630
Write Storage Device
640

Fig.6

VEHICLE CUSTOMIZATION, RESTRICTION, AND DATA LOGGING

The present invention is directed to the field of electronic control, and more specifically directed to vehicular electronic control.

When several people share the operating responsibilities of a vehicle, each particular operator needs to customize various settings, such as the angle of the mirrors and the position of the driver's seat. When another operator wants to operate the vehicle, he or she must reposition and reset all those customized features. Resetting all the devices in a complex vehicle can take time, and if not done correctly, such as the positioning of the mirrors, can result in accidents. Besides settings and preferences, restrictions may be imposed on certain operators of vehicles. For example a commercial truck driver may be authorized to drive no more than a limited number of hours per day. Often, there is presently no easy way to enforce these restrictions until after they have been violated, and quite often, there is no way to determine if the restrictions have been violated at all.

Presently, vehicle device settings are generally changed manually. These settings include vehicle mirrors, temperature settings, radio station preferences, seat positions, and so on. Even if the devices changed are driven by electric motors, the driver or operator of the vehicle sets each of them to his or her preference.

When restrictions are imposed on a vehicle operator, most often they are enforced by other people, such as law enforcement officers and parents. In the case of convicted drunk drivers, some vehicles may be equipped with a breathalyser machine which does not allow the driver to move the car without first passing a breath test for alcohol.

While devices in a vehicle are being transformed from mechanical to electronic control, many devices combine mechanical operation with increasing electronic content. There is presently little or no communication between the devices and/or the specific allocation of a device to satisfy requirements/desires of a particular operator. In some cases, vehicle communication considerations are generally and primarily employed to reduce the weight and cost of point to point wiring harnesses.

The invention leverages the increasing electronic content in modern vehicles by connecting these electronic devices. These electronic devices are herein referred to also as electronic islands connected to a controller. It further uses a storage device in the vehicle, to store vehicle customizations and/or restrictions, and to provide capability for defining and logging significant vehicle events. Combining the

electronic vehicle components with a storage device and a controller in a vehicle network enables providing operator specific settings for each of a set of vehicle operators.

These customizations add to operator and passenger comfort and safety. They also enable application of setting restrictions to and log the vehicle's use parameters. These add previously unavailable tools to entities as diverse as a parent monitoring a teen driver, a company or government agency regulating a truck driver, vessel captain or pilot, a vehicle training facility, a rental car company setting terms for a car rental and handling returns off line, and a car owner relinquishing the vehicle to a parking lot attendant.

An aspect of the invention is to provide a method for controlling vehicle settings. The method comprises providing a list of customization settings for at least a first user, reading a first portion of information from the list, and writing a third portion of information from information obtained in the step of reading to at least one functional device in the vehicle.

In an embodiment the method further comprises the functional device(s) responding to the second portion of information; and/or the step of providing is comprised of the first user of the vehicle manually setting at least one functional device setting according to a desire, and saving the manual settings; and/or the step of providing includes providing a storage device for the first user; and/or the step of reading includes reading a second portion of information from the storage device; and/or the step of responding includes the functional device becoming enabled in a state in accordance with the information; and/or the step of providing is comprised of retrieving a particular user settings record from a storage system, and saving the retrieved user settings record in the storage device; and/or the customization settings customize the vehicle to at least one specification provided by the first user; and/or wherein the customization settings customize the vehicle to at least one other occupant; and/or the customization settings include restrictions to the use of the vehicle; and/or the storage device is portable and/or contactless; and/or the storage device conforms to an international standard and/or the functional device(s) includes a power seat positioner and/or the step of responding comprises optimizing deployment of an air bag in the vehicle according to the height of at least one occupant of the vehicle; and/or a vehicle authority is a rental agency or a vehicle insurance company agent; and/or the method further comprising inserting the storage device into a vehicle door; and/or the step of reading the third portion of information is performed by reading the storage device when inserted into a vehicle door; and/or the step of inserting unlocks the vehicle door; and/or the step of reading the third portion of

information is performed by reading the storage device when inserted into a vehicle door; and/or reading a current state of at least one functional device into a controller; and/or writing the current state to the storage device.

Another aspect of the invention is the provision of a method for controlling settings of at least one functional device in a vehicle. The method comprising: reading a current state of at least one functional device into a controller, writing information from the controller to at least one functional device, and the at least one functional device responding to the information.

In an embodiment of the method, the functional device(s) includes a clock and a global positioning system supplying time of day and date information; and/or the functional device includes a speedometer and a global positioning system supplying speed limit information, and a vehicle cruise control system which automatically controls an operating speed of the vehicle.

Still another aspect of the invention is the provision of an apparatus for controlling settings of a plurality of functional devices in a vehicle. The apparatus comprising: an acceptance device for accepting a plurality of user settings for a vehicle user, and a controller to forward the user settings from the acceptance device to at least one of the functional devices in the vehicle.

In an embodiment, the apparatus further comprises a storage device having a list of a first subset of settings for the user and/or the controller is enabled to read at least one current setting from at least one of the functional devices; and/or a device enabler to enable functional devices to respond to the user settings, and/or the enabler includes an ignition switch; and/or an input device capable of receiving a subset of user settings entered manually, and/or wherein a first entry in the second subset is construed to override a second entry in the first subset; and/or the acceptance device is located on a vehicle door; and/or the acceptance device is capable of receiving wireless communication signals from a storage device.

Another aspect of the invention is the provision of an apparatus for recording settings of a plurality of functional devices in a vehicle. In an embodiment, the apparatus comprises a monitor for monitoring to read at least one state setting of each of at least one of the functional devices, the at least one of the functional devices being capable of making available the at least one state to the device monitor, means for accepting to receive information from the device monitor, and means for storing to store the information received by the means for accepting.

In an embodiment, the apparatus further comprising wiring harness means to substantially interconnect the device monitor, the means for accepting, and the functional devices.

Another aspect of the present invention is to provide an article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for controlling vehicle settings, the computer readable program code means in the article of manufacture comprising a computer readable program code means for causing a computer to effect the steps of providing a list of customization settings for at least a first user, reading a first portion of information from the list, and writing a second portion of information from information obtained in the step of reading to at least one functional device in the vehicle.

In an embodiment, the computer readable program code means in the article of manufacture further comprises a computer readable program code means for causing a computer to effect the at least one functional device responding to the second portion of information; and/or the step of providing is comprised of the first user of the vehicle manually setting at least one functional device setting according to a desire, and saving the manual settings; and/or the step of providing includes providing a storage device for the first user; and/or the step of reading includes reading a second portion of information from the storage device; and/or the step of responding includes enabling the functional device in a state in accordance with the information; and/or the step of providing is comprised of retrieving a particular user settings record from a storage system, and saving the retrieved user settings record in the storage device; and/or the customization settings include restrictions to the use of the vehicle.

Another aspect of the present invention is to provide a computer program product comprising a computer usable medium having computer readable program code means embodied therein for controlling settings of at least one functional device in a vehicle. The computer readable program code means in the computer program product comprising computer readable program code means for causing a computer to effect: reading a current state of at least one functional device into a controller, and writing information from the controller to at least one functional device.

In an embodiment, the computer readable program code means in the computer program product further comprising computer readable program code means for causing a computer to effect, the functional device responding to the information; and/or the functional device includes a clock and a global positioning system supplying time of day and date information; and/or the at least one functional device includes a

suspension controller for controlling the suspension of the vehicle; and/or the step of responding comprises setting performance and comfort variations for the suspension.

Still another aspect of the present invention is to provide a program storage device readable by machine, tangibly embodying a program of instructions executable by the machine to perform method steps for controlling vehicle settings. The method comprising providing a list of customization settings for at least a first user, reading a first portion of information from the list, and writing a second portion of information from information obtained in the step of reading to at least one functional device in the vehicle.

In an embodiment, the method steps further comprises the functional device responding to the second portion of information; and/or the step of providing includes providing a storage device for the first user; and/or the step of responding includes the functional device becoming enabled in a state in accordance with the second portion of information.

Embodiments of the invention will now be described with reference to the accompanying drawings, in which:

Fig. 1 is an exemplary apparatus for controlling and logging vehicle settings in accordance with the present invention;

Fig. 2 is a flow chart for a general method of controlling or logging vehicle settings in accordance with the present invention;

Fig. 3 is an exemplary embodiment of a method to add restrictions temporarily in accordance with the present invention;

Fig. 4 is an exemplary embodiment of a method to remove the restriction added in the method of Fig. 3 in accordance with the present invention;

Fig. 5 is an exemplary apparatus for storing user customization, restriction, and logging request data on a storage device in accordance with the present invention; and

Fig. 6 is an alternate preferred method for storing user customization data on a storage device in accordance with the present invention.

Figure 1 shows an apparatus for controlling and logging vehicle settings specific to each vehicle operator. In an embodiment, the apparatus has a storage device 100. In an embodiment, the storage device

100 is incorporated in a portable data carrying unit such as a smart card. Smart cards meeting international standard ISO 7816, or ISO 10536, are well known in the state of the art. Alternate embodiments may employ other configurations such as one or more computer diskettes and/or a personal digital assistant, etc.

In the exemplary embodiment of Figure 1, the acceptance device 110 is a smart card reader capable of communicating with the smart card. Such acceptance devices are well known in the state of the art, typically being provided by the smart card manufacturer. Alternate storage devices also have well known corresponding acceptance devices.

As shown in Figure 1, there may optionally be more than one acceptance device 110. For example, there may be one or more acceptance devices 110 mounted outside the vehicle to which the apparatus applies, and one or more acceptance devices 110 mounted inside the vehicle. In an embodiment, the acceptance device is a vehicle entry lock on a front door. The apparatus further includes a functional device 120. The functional device 120 is a vehicle component capable of being read and/or controlled via electronic means. Such vehicle components include but are not limited to drive components, safety components and general purpose components. The drive components include components such as an engine controller, transmission controller, suspension controller, power steering controller, brake controller, cruise control, or speedometer, etc. The safety components include components such as seat belt sensors, air bag deployment controller, and/or seat occupancy sensor, etc. The general purpose components include components such as a radio, temperature controller, steering wheel tilt control, remote mirrors, door, hood, glove box, and trunk locks, global positioning system, clock, a keypad used for keyless entry, or a keypad used for an acuity test or user verification.

The apparatus also includes a controller 130.

The controller 130 is often a rugged but inexpensive stored program microcontroller. Such controllers are well known to those familiar in the art. A connection 140 between the functional devices and the controller may be implemented for example as a bus. In some cases it apparatus may employ a bus which meets the requirements of the ISO 11898 Controller Area Network (CAN). CAN is generally a means of reducing the size and weight of a vehicle wiring harness. In an alternate embodiment, the acceptance device 110 is also connected to the bus. In an alternate embodiment of the connection 140, a bus is not used and all devices are connected to the controller through private wiring. Combinations of a bus architecture and private wiring to optimize performance and cost may also be employed.

In this invention, the concept of electronic control of vehicle functions can be combined with that of a controller to provide new functions.

Figure 2 is a flow chart for a general method of controlling or logging vehicle settings. In step 200, the storage device 100 is presented to a storage device acceptance unit 110 when required by the functional application. It is assumed that the storage device 100 already has the device settings specific to the particular vehicle operator. If not, the operator may manually or semi-automatically position the functional devices to that operators desired/required settings. This settings are monitored and loaded into the storage device for continued use until modified by that operator and/or an operator surrogate/manager. In step 210, the storage device 100 is read by the controller 130 using the storage device acceptance unit 110. In step 220, one or more functional devices 120 are read by the controller 130. Data from the storage device 100 (if any) and one or more functional devices 120 are combined and processed in step 230.

Depending upon the particular function application steps 200, 210 and 220 are optional and may or may not be present. However at least one of steps 200 and 210 or step 220 must be present so that input data is available to the controller 130 for use in step 230.

In step 240, processed data is written from the controller 130 to the storage device 100 through the storage device acceptance unit 110. The updated data becomes available the next time the storage device is presented in step 200. In step 250, the resulting processed data is written from the controller 130 to one or more functional devices 120. In step 260 the new device settings are implemented by the device. Steps 240, 250 and 260 are optional and may or may not be present. However, at least one of step 240 or 250 must be present to complete an operation. Step 260 may in some cases only be performed when the vehicle ignition is turned on.

In an embodiment of step 210, the read data is a vehicle operator specific customization data. The customization data may include specific operator device settings for comfort, performance, and/or safety.

In an instance of the embodiment used for keyless vehicle entry, the vehicle operator or user causes the presentation of the storage device 100 (step 200) into an acceptance device 110 in the vehicle door. The controller 130 reads (step 210) from the storage device 100, verifies (step 230) the storage device 100 and activates (step 250) a functional device 120 to unlock the door. In an alternate embodiment, a functional

device 120 implementing a keypad is further read (step 220) by the controller 130 to verify (step 230) the holder of the storage device 100.

In another instance of the embodiment used for customizing seat positioning, the user inserts (step 200) the storage device 100 into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, translates (step 230) seat position distances and tilt into commands to a functional device 120 implementing a power seat positioner, writes (step 250) to the seat positioner and causes the seat to be positioned (step 260) at the specific user settings (step 260).

In another instance of the embodiment used for customizing steering wheel positioning, the user inserts (step 200) the storage device 100 into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, translates (step 230) steering wheel distance and tilt into commands to a functional device 120 implementing a steering wheel positioner, writes (step 250) to the positioner and causes the steering wheel to be positioned at the settings for the particular user (step 260).

In still another instance of the embodiment used for customizing mirror positioning, the user inserts or presents the storage device 100 (step 200) into an acceptance device 110. The controller 130 reads (step 210) the storage device 100, translates (step 230) the mirror angles into commands to a functional device 120 implementing a mirror positioner, and writes (step 250) the positioner.

In still another instance, the embodiment is used for customizing radio station buttons. In this case the user inserts (step 200) the storage device 100 into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, translates (step 230) radio station band and frequency data into commands to a functional device 120 implementing a radio, and writes (step 250) to the radio.

In an alternate embodiment for customizing radio station buttons, the storage device 100 holds preprogrammed station type preference data such as news, or classical or country music. The controller 130 also reads (step 220) a functional device 120 implementing a global positioning system (GPS). The GPS device 120 has radio station classification information in its data base. The controller 130 combines (step 230) radio station classification, band and frequency data from the functional device 120 and preferences from the storage device 100, into commands to a functional device 120 implementing a radio, and writes (step 250) to the radio. This also permits the radio to be reprogrammed as the vehicle movement from one area to another is sensed by the GPS.

In a further embodiment this permits the radio to be programmed for a rental car even in an unfamiliar area.

In another instance of the embodiment used for customizing temperature settings, the user inserts the storage device 100 (step 200) into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, translates (step 230) temperature settings into commands to a functional device 120 implementing a heating, ventilation, and air conditioning controller, and writes (step 250) to the controller.

In another instance of the embodiment used for customizing an air bag deployment profile. In this case, the user may present (step 200) the storage device 100 into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, translates (step 230) user physical characteristics such as height into commands to a functional device 120 implementing an air bag deployment controller, and writes (step 250) to the controller.

In another alternate embodiment, a functional device 120 implementing a keypad is further read (step 220) by the controller 130 (step 200) to verify (step 230) the holder of the storage device 100 before modifying the air bag deployment profile.

In still another alternate embodiment, a functional device 120 implementing a seat belt use indicator, and/or a functional device 120 implementing a vehicle speed indicator, and/or a functional device 120 implementing seat position indicator, and/or a functional device 120 implementing steering wheel position indicator, and/or a functional device 120 implementing seat occupied indicator is further read (step 220) by the controller 130 before modifying the air bag deployment profile.

In still another instance, the embodiment is used for customizing vehicle performance such as fuel economy versus responsiveness. In this case, the user may insert (step 200) the storage device 100 into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, translates (step 230) performance settings into commands to a functional device 120 implementing an engine and/or automatic transmission controller, and writes (step 250) the controller.

In another instance of the embodiment used for customizing vehicle performance such as ride handling versus comfort. Here, the user may present (step 200) the storage device 100 into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, translates (step 230) performance settings into commands to a functional

device 120 implementing a suspension controller or power steering controller, and writes (step 250) to the controller.

In another instance of the embodiment used for customizing vehicle performance such as brake pedal sensitivity, the user inserts (step 200) the storage device 100 into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, translates (step 230) performance settings into commands to a functional device 120 implementing a power brake controller, and writes (step 250) to the controller.

In another instance, the embodiment is used for customizing vehicle destinations. In this case, the user may insert (step 200) the storage device 100 into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, translates (step 230) destinations into commands to a functional device 120 implementing a global positioning system controller, and writes (step 250) the controller.

In another instance of the embodiment used for customizing vehicle speed of operation, the user inserts (step 200) the storage device 100 into an acceptance device 110. The controller 130 reads (step 210) the storage device 100, the data read (step 210) being desired vehicle speed relative to the speed limit. The controller 130 also reads (step 220) from a functional device 120 implementing a global positioning system, the device 120 having in its data base speed limit information for all and/or major roads. The data read (step 220) may include speed limit data for the current vehicle position. The controller 130 translates (step 230) the read data (step 210) and (step 220) processes them(step 230) into commands to a functional device 120 implementing a cruise control, and writes (step 250) to the cruise control.

In an alternate embodiment, a warning is issued if the speed limit relative to the read data (step 210) and (step 220) is exceeded for more than a desired specified and/or preprogrammed time. In another alternate embodiment, the speed can also be adapted to anticipate curves and intersections. This may use a GPS device and/or a scene monitoring and reporting device.

In an alternate preferred embodiment, the controller 130 reads (step 220) from functional devices 120 and writes (step 250) to functional devices 120.

In one instance of the embodiment, the global positioning system provides time of day information, which can be reformatted and written to the vehicle clock. Such a method may also be employed to automatically adjust for time zone. Alternatively, the time of day can be retrieved

from a broadcast via the radio. In another instance of the embodiment, the global positioning system can detect a change in road type and warn the user or disengage the cruise control.

It will be apparent to those skilled in the art that the present invention may be used to read and employ data containing other user customizations for comfort, performance, or safety not described here. Additional communication among functional devices through the controller may also be implemented.

In still another alternate preferred embodiment, the read data (step 210) indicates to the controller 130 that a user restriction is in effect. In an alternate embodiment, the read data (step 210) may include an indication to the controller 130 that operational data from functional devices (step 220) should be logged (step 240) to the storage device 100.

An example embodiment of a storage device 100 used to hold restriction data or logged data is a tamper resistant and copy resistant device. An example of such a storage device 100 is a smart card having these enhanced capabilities.

In one instance, the embodiment may be used to limit driving time for a truck driver. The driver and/or managing user presents (step 200) the storage device 100 (step 200) into an acceptance device 110. The controller 130 reads (step 210) the storage device 100, and determines the driving time allowed per 24 hour period. The controller 130 reads (step 220) functional devices 120 such as the engine controller to determine whether the engine is running, and/or the transmission controller or speed indicator to distinguish cruising time from idling time, idling time may be such as when the ignition is running for heating purposes while the driver is stopped at an overnight rest stop. The time of day read (step 220) from a functional device 120 such as the clock and duration of operation of the vehicle are logged (step 240) to the storage device 100.

In an alternate preferred embodiment, driving time violations are logged (step 240) to the storage device 100. If the driver attempts to restart the truck to drive it, the driver can be refused a right to operate the vehicle. Such refusal may be allowed to be overridden. The trucking company or government authority can check the driver's storage device 100 at periodic intervals for violations. This may be able to be performed remotely and/or periodically via a communications link connecting the vehicle and company and/or authority.

Another instance of the embodiment may be used to limit driving hours. For example, drivers with such restrictions may be able to drive

only during daylight hours. The user inserts the storage device 100 (step 200) into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, and determines the permitted driving hours. The controller 130 reads (step 220) the time of day from a functional device 120 such as the clock, and driving times are logged (step 240) to the storage device 100.

In an alternate embodiment, driving time violations may be logged (step 240). In another alternate embodiment, the driver's request to drive may be rejected during a prohibited time. In an alternate embodiment, the refusal can be overridden. The driver's storage device 100 may read at periodic intervals for violations at rest stations interconnecting with an authority via a telephone connection to the apparatus.

In an alternate preferred embodiment, the time of day is read (step 220) from a tamper resistant functional device 120 such as a global positioning system. Such a functional device 120 can also provide latitude and longitude data as well, permitting a restriction relative to daylight hours rather than an absolute time.

Another instance of the embodiment is used to implement an expiration date and time. For example, a card given to a parking attendant may be caused to become worthless after a period of time, for example after one day. The user inserts the storage device 100 (step 200) from into an acceptance device 110. The controller 130 reads (step 210) the storage device 100, and determines the expiration date and time. The controller 130 reads (step 220) the time of day from a functional device 120 such as the clock, decides whether to allow access and/or operation of the vehicle.

Another instance of the embodiment is used to restrict driving location and/or log geographic information. For example, a driver with a substance abuse conviction may have specific restrictions. For example, the driver may be restricted to driving only between home and work. Similarly, a child may be restricted to the route between home and school. A rental car may have particular restrictions of the use of the vehicle. For example, the vehicle may be restricted relative to a particular boundary. This may include a prohibition from leaving the country of rental. A car given to a valet for parking, or a mechanic for repair, may be restricted to operate for a maximum distance from the point where the vehicle is transferred. The user inserts the storage device 100 (step 200) into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, and determines the permitted driving locations. The controller 130 reads (step 220) the location from a functional device 120 such as a global positioning

system, and destinations and/or routes are logged (step 240) to the storage device 100.

In an alternate embodiment, location violations are logged (step 240). In another alternate embodiment, the driver may be restricted and/or can be rejected from entering a prohibited location. In another alternate embodiment, the refusal may be overridden and the override may be logged (step 240). The driver's storage device 100 may be read at periodic intervals or various locations to determine the existence of violations and/or their severity.

In an alternate preferred embodiment of the previously described application for customizing vehicle speed of operation, speed limit violations may be logged (step 240) to the storage device 100. The driver's storage device 100 may be read at progressive locations along a prescribed route and/or at periodic intervals for violations.

Another instance of the embodiment is used to limit and/or monitor access to locked areas. For example, temporary drivers such as a parking attendant or car wash employee with such restrictions may be able to drive the car, but be denied access to the glove box and/or the trunk and/or the engine compartment, listen to radio or watch a television set in the vehicle. This can be alone for example, wherein the user may present the storage device 100 (step 200) into an acceptance device 110. The controller 130 reads (step 210) from the storage device 100, and determines the access permission. The controller 130 may be made to refuse to unlock a locked area and/or disable functionality of a device for which permission is denied.

Still another instance of the embodiment uses the storage device 100 in a manner similar to the blackbox on an airplane. The controller 130 reads (step 200) a functional device 120 such as an air bag deployment controller which is used to sense a vehicle collision. Upon detecting an event indication for an event such as a collision, the controller reads (step 220) from a plurality of functional devices 120 such as speed, throttle, and brake status, headlight, wiper, and turn signal status, seat occupied indicators, and location and/or direction of travel data from the global positioning system. In some embodiments, equipment advances in positioning may allow lane position to be retrieved as well. In alternate embodiments, for example, situations controlled by time constraints, a subset of the information (for example, headlight status) may be read (step 220) at periodic intervals. This may be stored temporarily in the controller 130 to reduce the amount of information read (step 220) from functional devices 120 after a collision is detected. The controller 130 may write (step 240) the status information to the storage device 100. In cases where the storage device 100 is

provably tamper resistant, the information may be used for accident investigation and insurance, etc.

Another instance of the embodiment is used to log seat belt usage. A functional device 120 such as a seat belt sensor is read (step 220) by the controller 130 and usage violations are written (step 240) to the storage device 100.

In another instance of the embodiment, the restriction data indicates that the driver is required to pass an acuity test. The controller 130 reads (step 220) a functional device 120 used for a non-trivial acuity test, such as a display and key pad requiring timed and/or rapid entering of a displayed message. An appropriate set of tests may be stored on the storage device (smart card) and a different set of tests may be presented each time the driver wants to operate the vehicle. In the case that the controller determines (step 230) that the driver has failed a test, such as the acuity test, the controller may prohibit operation of the vehicle by that user/operator.

Other user restriction and user logging data types not described here are also contemplated.

In another instance of the embodiment, the restriction data may indicate that the controller 130 should temporarily ignore a first unrestricted storage device 100, and only accept a second restricted storage device 100. An identical procedure may be used to add or remove logging requests. Therefore, only the method for adding restrictions need be described in detail herein.

A first unrestricted storage device 100 may be given the characteristic that it may be freely copied so that it can be replicated in case the original is lost or damaged. Methods for reading and writing a storage device 100 for replication are well known. This generally requires that the original first storage device 100 is not protected from unauthorized reading.

A second restricted storage device 100 may have most of the data freely readable, but a subset of the device may be made not readable. This could prevents usable copies of the card from being made.

Figure 3 shows the steps of an exemplary method to add restrictions temporarily to an otherwise unrestricted storage device (USD).

In step 300, the unrestricted storage device is provided to an external controller. Controllers capable of reading and writing to a

variety of storage devices are well known. This is so even when the storage device is a smart card.

In step 305, the external controller may be authorized to access all storage device data. The authorization method can be a password or personal identification number, etc. This authorization prevents illicit copying of the card, such copying being used for either theft or denial of service attacks. In step 310, the unrestricted storage device is read and copied to the restricted storage device. In step 315, a flag for the vehicle controller 130 saying "change to the restricted storage device" is added to the restricted storage device. The flag may also be protected by a password or personal identification number, etc.

In step 320, a restricted storage device key is added to the restricted storage device. This key is known to the restricting party, which may be an authority over the vehicle and/or vehicle operator. In the examples described previously, the authority is a rental car agency, a trucking company, a government agency such as a motor vehicle bureau, or the car owner passing a restricted storage device to a parking lot attendant, mechanic, or teen driver, etc. Usually, the key is not known to the operator ultimately receiving the storage device (smart card) with the restrictions.

In step 325, the prescribed and/or desired restrictions and/or logging requests are added to the restricted storage device. In step 330, the restricted storage device is provided to the internal vehicle controller 130. In step 335, the restricted storage device is validated (authorized) to the vehicle controller 130. Thus far, the restricted storage device may act as an unrestricted storage device.

In step 340, the vehicle controller 130 notes the flag. In step 350, the vehicle controller 130 reads and stores the restricted storage device key. If the key is the public part of an asymmetric key, this key may remain freely readable. If the key is a symmetric key, it must be protected from further reading in step 360 once stored in the vehicle controller 130.

The implementation of the steps in Figure 3, generally causes the vehicle controller to respond only to the restricted storage device. In an alternate embodiment the vehicle controller responds to both restricted and unrestricted devices, but in differing ways.

Figure 4 shows the steps of an exemplary method to remove one or more restrictions from a storage device (e.g. a smart card). These steps may be used, for instance, to remove the restriction added in the method of Figure 3. In step 400, the restricted storage device is

provided to an external controller. In step 410, the external controller is authorized to have access to the storage device.

In step 420, a flag for the vehicle controller 130 indicating "change to a semi-restricted or to unrestricted storage device" is added to the restricted storage device after the storage device presents a password or personal identification number etc. In step 430, the restricted storage device is provided to the vehicle controller 130. In step 440, the restricted storage device is validated to the vehicle controller 130. In step 450, the vehicle controller 130 notes the flag added in step 420. In step 460, the vehicle controller 130 reads and restores the unrestricted or semi-restricted status of the storage device key.

Implementation of the steps in Figure 4, enables the vehicle controller to now respond to the unrestricted or semi-restricted storage device. To implement this procedure, it is best that the storage device be provided with functionality such as password protected writes, authorizing to an external controller, authorizing an external controller, and protection from reads. A smart card is an example of a device upon which this functionality can be provided.

Figure 5 shows an exemplary apparatus for storing user customization, restriction, and logging request data on a storage device 100. It is assumed that vehicle operator specific data originates in a vehicle operator data file 500. In various embodiments this data file is owned by the operator, the owner of the vehicle such as a rental car company, or a third party.

In the example of a rental car company, the operator data file may provide the customer's basic profile of customizations, and may add additional data such as hotel, restaurant, and business locations use by a global positioning system. This information may be received from a travel agent. The file may also contain rental rates and origin of rental. This may be used for example for off line check in. For off line check in, the storage device may also be initialized to log mileage, final drop off location, and fuel gauge reading.

In an embodiment of this apparatus, the data from the data file may be read by the controller 510, routed to the acceptance device 510 attached to the controller 510, and from there loaded into the storage device 100.

The same apparatus of Figure 5 can be used for backup storage of data from the storage device 100 written using the method of Figure 6. Figure 6 shows an alternate method and/or apparatus for storing user

customization data on a storage device 100. In an embodiment using this apparatus, an operator manually adjusts 600 a plurality of functional devices 120 according to preferences. Once satisfied, the operator uses a functional device 120 such as a keypad to trigger 610 the controller 130 to read 620 from the functional devices 120, process 630 the read data, and write 640 the results of the processing to the storage device 100 through an acceptance device 110.

It will be seen that although the vehicle is described variously as a land vehicle, the basic invention and its concepts may similarly be implemented in sea, space and/or air vehicles or especially vehicle trainers, etc.

CLAIMS

1. A method for controlling vehicle settings of functional devices in a vehicle, said method comprising:

providing a list of customization settings of at least one functional device for at least a first user of the vehicle, and

setting at least one of the functional devices to at least one of said customization settings.

2. A method for controlling vehicle settings of functional devices in a vehicle, said method comprising:

providing a list of customization settings of at least one functional device for at least a first user of the vehicle,

reading a first portion of information from the list, and

taking a second portion of information from the first portion of information;

writing the second portion of information to said at least one functional device in the vehicle.

3. A method as recited in claim 2, further comprising the step of enabling said at least one functional device to respond to said second portion of information.

4. A method as recited in claim 2, wherein the step of providing is comprised of:

said first user manually setting at least one functional device setting according to a desire, and

saving the manual settings.

5. A method as recited in claim 2, wherein the step of providing includes furnishing a storage device used for storing a plurality of customization settings for the first user.

6. A method as recited in claim 5, wherein the step of reading includes reading a second portion of information from the storage device.

7. A method as recited in claim 6, wherein the step of reading is performed by reading the storage device when inserted into a vehicle door.

8. A method as recited in claim 7, wherein the step of inserting the storage device unlocks the vehicle door.

9. A method as recited in claim 3, wherein the step of responding includes the functional device becoming enabled in a state in accordance with the information.

10. A method as recited in claim 3, further comprising the step of customizing the vehicle to said first user and a second user.

11. A method as recited in claim 3, wherein said customization settings include restrictions to the use of the vehicle.

12. A method as recited in claim 5, wherein the storage device includes a smart card conforming to an ISO 7816 standard.

13. A method as recited in claim 5, wherein the storage device is a contactless device conforming to an ISO 10536 standard.

14. A method as recited in claim 2, wherein the at least one functional device includes a seat positioner, and the step of responding comprises the step of moving a seat forward, back, up, down, tilt forward and tilt back.

15. A method as recited in claim 2, wherein said at least one functional device includes a radio, and the step of responding comprises the step of setting station selection buttons, volume, tone control and speaker selection for the radio.

16. A method as recited in claim 2, wherein one of the functional devices includes a mirror and the step of responding comprises the step of moving the mirror up, down, right and left.

17. A method as recited in claim 2, wherein said at least one functional device includes an engine controller for controlling an engine in the vehicle and the step of responding comprises the step of setting performance and economy variations for the engine.

18. A method as recited in claim 2, wherein the at least one functional device includes a transmission controller for controlling a transmission in the vehicle and the step of responding comprises the step of setting performance and economy variations for the transmission.

19. A method as recited in claim 2, wherein one of the functional devices includes a suspension controller for controlling the suspension of the vehicle and the step of responding comprises the step of setting performance and comfort variations for the suspension.

20. A method as recited in claim 2, wherein the at least one functional device includes a power steering controller and the step of responding comprises the step of setting levels of steering effort in the power steering controller for the first user.

21. A method as recited in claim 2, wherein the at least one functional device includes a power brake controller and the step of responding comprises the step of setting levels of braking effort for the first user.

22. A method as recited in claim 2, wherein the at least one functional device includes a passenger compartment temperature controller and the step of responding comprises the step of setting a temperature in the vehicle.

23. A method as recited in claim 2, wherein the at least one functional device includes a steering wheel position controller and the step of responding comprises the step of adjusting the wheel tilt angle of a steering wheel in the vehicle.

24. A method as recited in claim 2, wherein the at least one functional device includes an air bag deployment controller and the step of responding comprises the step of optimizing deployment of an air bag in the vehicle according to the height of at least one occupant of the vehicle.

25. A method as recited in claim 5, wherein the at least one functional device includes a global position system and the step of responding comprises the step of storing for easy retrieval a list of travel destinations useful for the global positioning system for supporting travel route determination.

26. A method as recited in claim 5, wherein the step of providing is comprised of:

retrieving a particular user settings record from a storage system, and

saving the retrieved user settings record in the storage device.

27. A method as recited in claim 2, wherein the at least one functional device includes a lock.

28. A method as recited in claim 27, further comprising a vehicle authority placing the lock in a state which disables the lock from being opened.

29. A method as recited in claim 2, wherein the step of reading is performed by a reader and the step of writing is performed by a writer, and the method further comprises the step of turning on an ignition of the vehicle to enable the reader to read and/or the writer to write.

30. A method as recited in claim 2, wherein the first user is one user of a plurality of users of the vehicle and wherein at least a portion of the information is specific to each of said users.

31. A method as recited in claim 30, further comprising assigning a set of vehicle operation authorizations and restrictions to at least one of the users.

32. A method as recited in claim 31, further comprising maintaining a log of at least one utilization parameter for at least one of the users.

33. A method as recited in claim 32, further comprising enabling a vehicle user controller in accordance with the utilization parameter of at least one of the users.

34. A method as in claim 33, wherein the utilization parameter is maximum vehicle speed and said step of enabling includes limiting vehicle operation to a speed less than the maximum vehicle speed.

35. A method as recited in claim 28, wherein the lock is a trunk lock and the vehicle authority is the first user.

36. A method as recited in claim 28, wherein the vehicle authority is a rental agency and the lock controls the availability of a rental option.

37. A method as recited in claim 28, wherein one of the at least one functional device is an accident monitoring device, the lock controls the accident monitoring device and the authority is a vehicle insurance company agent.

38. A method as recited in claim 28, wherein the authority is an accident investigation officer.

39. A method as recited in claim 2, further comprising the step of reading a current state of said at least one functional device into said controller.

40. A method as recited in claim 39, wherein a device from said at least one functional device supplies the time of day and date.

41. A method as recited in claim 39, wherein said at least one functional device includes one of a radio receiver or a vehicle global positioning system reading a broadcast time stamp to determine a current time of day.

42. A method as recited in claim 5, wherein said customization setting includes a set of prohibited vehicle operation times.

43. A method as recited in claim 42, further comprising the step of notifying a vehicle driver of impending restrictions.

44. A method as recited in claim 42, further comprising the step of writing a log of prohibited vehicle operation to said storage device.

45. A method as recited in claim 39, wherein the step of reading includes monitoring a time of day and a trip duration.

46. A method as recited in claim 45, further comprising the step of notifying a vehicle driver or impending restrictions based upon the time of day and trip duration.

47. A method as recited in claim 2, further comprising the step of implementing at least one operation restriction upon the vehicle driver.

48. A method as recited in claim 47, further comprising the step of overriding at least one of the at least one restriction.

49. A method as recited in claim 45, further comprising the step of writing a log of vehicle operation including time of day to said storage device.

50. A method as recited in claim 45, further comprising the step of reading speedometer parameters in order to distinguish between a vehicle travel operation period and a vehicle idling period during a non-travel operation.

51. A method as recited in claim 45, further comprising the step of reading at least one vehicle transmission parameter to distinguish a

vehicle travel operation period from a vehicle idling period during a rest period.

52. A method as recited in claim 39, wherein one device from said at least one functional device supplies a current vehicle location position.

53. A method as recited in claim 52, further comprising the steps of:

comparing the current vehicle location position to an entry in the at least one customization setting, and

determining that a driver of the vehicle is entering a prohibited location.

54. A method as recited in claim 53, further comprising the step of warning the driver that the vehicle is entering the prohibited location.

55. A method as recited in claim 53, further comprising the step of disabling at least one functional operation of the vehicle as said vehicle enters the prohibited location.

56. A method as recited in claim 53, wherein said step of determining includes indicating the vehicle entered the prohibited location and writing a log to said storage device.

57. A method as recited in claim 53, wherein the prohibited location includes an absolute location.

58. A method as recited in claim 57, wherein the absolute location includes a country border.

59. A method as recited in claim 53, wherein the prohibited location includes a location related to a location given in the list.

60. A method as recited in claim 50, wherein the relative location includes a distance from a starting point given in the list.

61. A method as recited in claim 39, further comprising the step of writing at least one item of information relevant to the vehicle from the controller to a storage device.

62. A method as recited in claim 61, wherein the at least one functional device includes a global positioning system and the at least one item of information includes a destination log.

63. A method as recited in claim 61, wherein the at least one functional device includes an air bag deployment indicator and the at least one item of information includes a plurality of vehicle state parameters at a time of deployment.

64. A method as recited in claim 63, wherein one of the state parameters is a vehicle speed.

65. A method as recited in claim 61, wherein the at least one functional device includes a vehicle speed indicator and a global positioning system, the global positioning system supplying speed limit information, the at least one customization setting includes a speed limit warning threshold, and the at least one item of information includes a log of speed limit violations.

66. A method for controlling settings of at least one functional device in a vehicle, said method comprising:

reading a current state of at least one functional device into a controller,

writing the current state from the controller to at least one other functional device, and

said at least one other functional device responding to the current state.

67. A method as recited in claim 66, wherein the at least one functional device includes a speedometer and a global positioning system supplying speed limit information, and a vehicle cruise control system which automatically controls an operating speed of the vehicle.

68. An apparatus for controlling settings of a plurality of functional devices in a vehicle, the apparatus comprising:

an acceptance device for accepting a plurality of user settings for a vehicle user, and

a controller to forward the user settings from the acceptance device to at least one of the functional devices in the vehicle.

69. An apparatus as recited in claim 68, further comprising a storage device having a list of a first subset of settings for the user.

70. An apparatus as recited in claim 68, wherein the controller is enabled to read at least one current setting from at least one of the functional devices.

71. An apparatus as recited in claim 68, further comprising a device enabler to enable functional devices to respond to the user settings.

72. An apparatus as recited in claim 71, wherein the enabler includes an ignition switch.

73. An apparatus as recited in claim 69, further comprising the step of an input device capable of receiving a subset of user settings entered manually.

74. An apparatus as recited in claim 73, wherein a first entry in the second subset is construed to override a second entry in the first subset.

75. An apparatus for recording settings of a plurality of functional devices in a vehicle, the apparatus comprising:

a device monitor to read at least one state setting of at least one of the functional devices, said at least one of the functional devices being capable of making available said at least one state setting to the device monitor,

an acceptance device to receive information from the device monitor, said information including at least a portion of said at least one state setting and

a storage device to store the information received by the acceptance device.

76. An apparatus as recited in claim 75, further comprising a wiring harness to substantially interconnect the device monitor, the acceptance device, and at least one of the functional devices.

77. An apparatus as recited in claim 76, wherein the wiring harness includes a bus meeting the requirements of an ISO 11898 Controller Area Network.

78. An apparatus as recited in claim 75, wherein the storage device includes at least one floppy disk.

79. An apparatus as recited in claim 68 or 75, wherein one of the functional devices includes one of a power seat positioner, a radio, a

mirror, a vehicle engine controller, a transmission controller, a suspension controller, a power steering controller, a steering wheel position controller, an air bag deployment controller, a global positioning system, a lock.

80. An apparatus as recited in claim 68, wherein one of the functional devices includes a power brake controller and the vehicle is a truck.

81. An apparatus as recited in claim 68, wherein one of the functional devices includes a passenger compartment temperature controller and the vehicle is an aircraft vehicle.

82. An apparatus as recited in claim 68, wherein the vehicle is an undersea diving vehicle.

83. An apparatus for controlling settings of a plurality of functional devices in a vehicle, the apparatus comprising:

means for accepting a plurality of user settings for a vehicle user, and

means for controlling for forwarding the user settings from the means for accepting to at least one of the functional devices in the vehicle.

84. An apparatus as recited in claim 83, further comprising means for storing having a list of at least a subset of settings for the user.

85. An apparatus as recited in claim 83, wherein the means for controlling is enabled to read at least one current setting from at least one of the functional devices.

86. An apparatus as recited in claim 83, further comprising means for enabling for enabling functional devices to respond to the user settings.

87. An apparatus as recited in claim 84, further comprising means for accepting an input capable of receiving a second subset of the user settings entered manually.

88. An apparatus as recited in claim 87, wherein a first entry in the second subset is capable of overriding a second entry in the first subset.

89. An apparatus for recording settings of a plurality of functional devices in a vehicle, the apparatus comprising:

monitor means for monitoring to read at least one state setting of each of at least one of the functional devices, said at least one of the functional devices being capable of making available the at least one state to the device monitor,

means for accepting to receive information from the monitor means, and

means for storing to store the information received by the means for accepting.

90. An article of manufacture comprising a computer usable medium having computer readable program code means embodied therein for controlling vehicle settings, the computer readable program code means in said article of manufacture comprising computer readable program code means for causing a computer to effect the steps:

providing a list of customization settings for at least a first user,

reading a first portion of information from the list, and

writing a second portion of information from information obtained in said step of reading to at least one functional device in the vehicle.

91. An article of manufacture as recited in claim 90, the computer readable program code means in said article of manufacture further comprising computer readable program code means for causing a computer to effect said at least one functional device responding to said second portion of information.

92. An article of manufacture as recited in claim 90, wherein the step of providing is comprised of:

said first user of the vehicle manually setting at least one functional device setting according to a desire, and

saving the manual settings.

93. A computer program product comprising a computer usable medium having computer readable program code means embodied therein for controlling settings of at least one functional device in a vehicle, the computer readable program code means in said computer program product comprising computer readable program code means for causing a computer to effect:

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Application No:	GB 9905219.3	**Examiner:**	Michael Prescott
Claims searched:	1, 2, 66, 68, 75, 83, 89, 90, 93, 96 at least	**Date of search:**	25 May 1999

Patents Act 1977
Search Report under Section 17

Databases searched:

UK Patent Office collections, including GB, EP, WO & US patent specifications, in:

UK Cl (Ed.Q): G3N (NGA4, NGBC2, NGB2A, NGB2, NGBD1, NGBD, NGF, NGF2, NGL, NG1A4, NG1A9, NG1AX, NG1B)

Int Cl (Ed.6): B60R 25/00

Other: Online databases: EPODOC, JAPIO, WPI

Documents considered to be relevant:

Category	Identity of document and relevant passage		Relevant to claims
X	GB 2273580 A	(Ford Motor Company) see whole document	1, 2, 66, 68, 75, 83, 89, 90, 93, 96 at least
X	GB 2090017 A	(Aisin Seiki) see abstract	1, 2, 66, 68, 75, 83, 89, 90, 93, 96 at least
X	EP 0770524 A1	(FIAT AUTO) see whole document	1, 2, 66, 68, 75, 83, 89, 90, 93, 96 at least
X	EP 0345785 A2	(NATCO Corporation) see whole document	1, 2, 66, 68, 75, 83, 89, 90, 93, 96 at least
X	EP 0178439 A1	(ANT Nachrichtentechnik) see abstract	1, 2, 66, 68, 75, 83, 89, 90, 93, 96 at least

X Document indicating lack of novelty or inventive step
Y Document indicating lack of inventive step if combined with one or more other documents of same category.
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A Document indicating technological background and/or state of the art.
P Document published on or after the declared priority date but before the filing date of this invention.
E Patent document published on or after, but with priority date earlier than, the filing date of this application.

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Application No: GB 9905219.3 **Examiner:** Michael Prescott
Claims searched: 1, 2, 66, 68, 75, 83, 89, 90, 93, 96 at least **Date of search:** 25 May 1999

Category	Identity of document and relevant passage	Relevant to claims
X	WO 84/03785 A1 (Ernst, H-H) see abstract	1, 2, 66, 68, 75, 83, 89, 90, 93, 96 at least
X	US 4477874 (Nippondenso Co.) see whole document	1, 2, 66, 68, 75, 83, 89, 90, 93, 96 at least

X	Document indicating lack of novelty or inventive step	A	Document indicating technological background and/or state of the art
Y	Document indicating lack of inventive step if combined with one or more other documents of same category.	P	Document published on or after the declared priority date but before the filing date of this invention.
&	Member of the same patent family	E	Patent document published on or after, but with priority date earlier than, the filing date of this application.